What is claimed is:

1. A semiconductor device, comprising:

a silicon layer;

an insulation layer formed on the silicon layer, wherein a partial portion of the insulation layer is opened to form a contact hole exposing a partial portion of the silicon layer;

an epitaxially grown titanium silicide layer having a phase of C49 and formed on the exposed silicon substrate disposed within the contact hole; and

a metal layer formed on an upper surface of the titanium silicide layer.

2. The semiconductor device as recited in claim 1, wherein the metal layer includes a titanium nitride barrier layer at a region contacting the titanium silicide layer to prevent diffusions of atoms between the metal layer and the silicon layer.

3. The semiconductor device as recited in claim 1, wherein the silicon layer and the titanium silicide layer have an orientation relationship as:

(060)[001]TiSi2 // (002)[110]Si.

4. The semiconductor device as recited in claim 1,

wherein the silicon layer is a silicon substrate.

5. The semiconductor device as recited in claim 1, wherein the metal layer is made of metal used for any one of a bit line, an electrode of a capacitor, a contact plug and an interconnection wire.

6. A semiconductor device, comprising:

a silicon substrate;

a device isolation layer locally formed in the silicon substrate and defining a field region and an active region;

a metal-oxide semiconductor (MOS) transistor formed in the active region of the silicon substrate and including a gate electrode and source/drain diffusion regions; and

a titanium silicide layer having a phase of C49 and being epitaxially grown on a surface of the silicon substrate disposed above each source/drain diffusion region.

7. The semiconductor device as recited in claim 6, wherein the silicon substrate and the titanium silicide layer have an orientation relationship as:

$$(060)[001]TiSi_2 \ // \ (002)[110]Si.$$

8. A method for fabricating a semiconductor device, comprising the steps of:

providing a silicon substrate on which predetermined processes are completed;

performing a plasma treatment to a surface of the silicon substrate in a gaseous atmosphere including nitrogen;

depositing a titanium layer on the silicon substrate by employing a physical vapor deposition (PVD) technique; and

causing the silicon substrate to react with the deposited titanium layer through the use of a thermal treatment to form an epitaxially grown titanium silicide layer having a phase of C49.

9. The method as recited in claim 8, wherein the plasma treatment is carried out by employing one of a nitrogen (N_2) plasma treatment and an ammonium (NH_3) plasma treatment.

10. The method as recited in claim 9, wherein the plasma treatment is carried out for about 30 seconds to about 60 seconds at a temperature ranging from about 400 °C to about 450 °C and a pressure ranging from about 3 Torr to about 5 Torr along with power ranging from about 400 W to about 500 W.

11. The method as recited in claim 8, wherein the PVD technique is an ion metal plasma (IMP) technique.

12. The method as recited in claim 8, wherein the thermal treatment performed in the atmosphere of nitrogen

results in formation of a titanium nitride layer on a surface of the titanium layer.

13. The method as recited in claim 8, wherein the thermal treatment is one of a rapid thermal process (RTP) and a furnace annealing.

14. The method as recited in claim 12, wherein the thermal treatment is one of a rapid thermal process (RTP) and a furnace annealing.

15. The method as recited in claim 8, wherein the thermal treatment includes the steps of:

performing a first RTP at a temperature ranging from about 670 °C to about 850 °C for about 20 seconds to about 30 seconds; and

performing a second RTP at a temperature ranging from about 850°C to about 900 °C for about 20 seconds to about 30 seconds.

16. The method as recited in claim 12, wherein the thermal treatment includes the steps of:

performing a first RTP at a temperature ranging from about 670 °C to about 850 °C for about 20 seconds to about 30 seconds; and

performing a second RTP at a temperature ranging from

about 850°C to about 900 °C for about 20 seconds to about 30 seconds.

17. The method as recited claim 8, further comprising the step of cleaning the silicon substrate prior to performing the plasma treatment.

18. The method as recited in claim 17, wherein the cleaning proceeds by employing one of a wet cleaning process using buffered oxide etchant (BOE) or hydrofluoric acid (HF) and a dry cleaning process using nitrogen trifluoride (NF_3).

19. A method for fabricating a semiconductor device, comprising the steps of:

forming a device isolation layer for defining a field region and an active region in a silicon substrate;

forming a transistor including source/drain diffusion regions in the active region of the silicon substrate;

performing a plasma treatment to the silicon substrate disposed above each source/drain region in a gaseous atmosphere including nitrogen;

depositing a titanium layer on the silicon substrate by employing a PVD technique;

causing the silicon substrate to react with the deposited titanium layer through the use of a thermal treatment to form an epitaxially grown titanium silicide layer

having a phase of C49; and

removing the non-reacted titanium layer.

20. The method as recited in claim 19, wherein the plasma treatment proceeds by employing one of a N_2 plasma treatment and a NH_3 plasma treatment.

21. The method as recited in claim 20, wherein the plasma treatment is carried out for about 30 seconds to about 60 seconds at a temperature ranging from about 400 °C to about 450 °C and a pressure ranging from about 3 Torr to about 5 Torr along with power ranging from about 400 W to about 500 W.

22. The method as recited in claim 19, wherein the thermal treatment includes the steps of:

performing a first RTP at a temperature ranging from about 670 °C to about 850 °C for about 20 seconds to about 30 seconds; and

performing a second RTP at a temperature ranging from about 850 °C to about 900 °C for about 20 seconds to about 30 seconds.

23. The method as recited in claim 19, further comprising the step of cleaning the silicon substrate in the source/drain diffusion regions prior to performing the plasma treatment by employing one of a wet cleaning process using BOE

or HF and a dry cleaning process using NF3.

24. A method for fabricating a semiconductor device, comprising the steps of:

providing a silicon substrate in which predetermined processes are completed; and

flowing a source gas of Ti and a reduction gas to epitaxially grow a titanium silicide layer having a phase of C49 by using a chemical vapor deposition (CVD) technique using a surface reaction with the silicon substrate and a vapor reaction.

25. The method as recited in claim 24, wherein the CVD technique uses titanium tetrachloride ($TiCl_4$) and hydrogen (H_2) as a deposition gas.

26. The method as recited in claim 24, wherein the CVD technique uses titanium tetrachloride ($TiCl_4$), hydrogen (H_2) and silane (SiH_4) as a deposition gas.

27. The method as recited in claim 24, wherein the CVD technique uses $TiCl_4$ and SiH_4 as a deposition gas.

28. The method as recited in claim 25, wherein the employed CVD technique is a plasma enhanced chemical vapor deposition (PECVD) technique carried out at a temperature

ranging from about 550 °C to about 800 °C and a pressure ranging from about 1 Torr to about 20 Torr along with power ranging from about 200 W to about 800 W.

29. The method as recited in claim 26, wherein the employed CVD technique is a PECVD technique carried out at a temperature ranging from about 550 °C to about 800 °C and a pressure ranging from about 1 Torr to about 20 Torr along with power ranging from about 200 W to about 800 W.

30. The method as recited in claim 27, wherein the employed CVD technique is a plasma enhanced chemical vapor deposition (PECVD) technique carried out at a temperature of about 550 °C to about 800 °C and a pressure of about 1 Torr to about 20 Torr with supplied power of about 200 W to about 800 W.

31. The method as recited in claim 24, further comprising the step of cleaning the silicon substrate by employing one of a wet cleaning process using BOE or HF and a dry cleaning process using NF_3.

32. A method for fabricating a semiconductor device, comprising the steps of:

(a) loading a silicon substrate to which predetermined processes are completed in a chamber for an atomic layer

deposition (ALD) technique;

(b) flowing a source gas of titanium into the chamber;

(c) purging the non-reacted source gas of titanium from the chamber;

(d) flowing a reduction gas into the chamber;

(e) purging the reaction gas from the chamber; and

(f) repeating the steps (a) to (e) a sufficient number of times to form an epitaxially grown titanium silicide layer having a phase of C49 by employing the ALD technique.

33. The method as recited in claim 32, wherein the source gas of titanium includes $TiCl_4$ and the reduction gas includes H_2 or SiH_4.

34. The method as recited in claim 32, wherein the ALD technique is carried out at a temperature ranging from about 400 °C to about 700 °C and a pressure ranging from about 0.1 Torr to about 10 Torr.

35. The method as recited in claim 32, wherein the ALD technique uses a plasma.

36. The method as recited in claim 32, further comprising the step of cleaning the silicon substrate by employing one of a wet cleaning process using BOE or HF and a dry cleaning process using NF_3.